



A TIME CRITICAL SYSTEMS APPROACH to STROKE and STEMI in MISSOURI

Samar Muzaffar, MD MPH

OVERVIEW

- ☞ Stroke
- ☞ STEMI
- ☞ Trauma as a model
- ☞ Next Steps

STROKE

- ☞ Stroke is the 3rd leading cause of death in the US and Missouri
- ☞ In Missouri, 6.5% of deaths in 2004 were due to cerebrovascular disease (CDC 2004 WISQARS)
- ☞ Rural populations face unique challenges in access to timely stroke care

☞ MMWR 2007 56(19): 474-478

☞ Okon, N., et al 2006.

STROKE

- 👉 Nationally, 700,000 people annually suffer a new or recurrent stroke
 - 👉 15-30% will be disabled (leading cause of disability)
 - 👉 20% require institutionalization first 3 months post-stroke

STROKE

- ☞ Ischemic stroke accounts for 80% of all strokes
- ☞ Prompt treatment reduces death and disability
- ☞ However, only a small percentage of stroke victims get the recommended treatment within the recommended time

STROKE

☞ Why “time critical”?

☞ Evidence shows patients treated with t-PA 0 to 90 minutes from stroke onset have

- ☞ Increased odds of improvement at 24 hours
- ☞ Improved 3-month outcome

STROKE

- ☞ With delayed treatment
 - ☞ Patients treated after 90 minutes from symptom onset have poorer outcomes
 - ☞ Graded response to t-PA with reduced recovery after 90 minutes
 - ☞ Less benefit, more hemorrhages

JB Marler, et al 2000

STROKE

☞ Per the National Stroke Association's
Acute Stroke Advisory Board Chairman
Dr. Marc Fisher

☞ “..every state needs to recognize the
importance of creating a model for stroke
care”

STROKE

☞ The American Heart Association has recommended that stroke programs be organized regionally nationwide

STROKE

- ☞ The Brain Attack Coalition, American Stroke Association, and Joint Commission with the AHA have put forth:
 - ☞ Standardized performance measures for stroke care
 - ☞ Recommendations for primary stroke centers
 - ☞ Certification process

STROKE

- ☞ Data from regionalized systems:
 - ☞ Improved access to neurologists, especially for rural areas (Stroke Journal Report, 5/2/03)
 - ☞ Decreased time from symptom onset to ED arrival
 - ☞ Improved door to treatment time
 - ☞ Increased use of t-PA
 - ☞ Long-term: anticipate reduced mortality and disability

STROKE: What's being done around the country?

☞ North Carolina

☞ Statewide Trauma and Stroke System Act, 2006

☞ Development of statewide trauma and stroke system

STROKE: What's being done around the country?

👉 North Carolina, Key components:

- 👉 Statewide trauma and stroke registry
- 👉 Statewide educational requirements
- 👉 Credentialing/Certification standards
- 👉 Peer review committee, multifaceted
- 👉 NC Emergency Medical Services Advisory Council created
- 👉 Outcomes evaluation/performance management

STROKE: What's being done around the country?

👉 New York State

- 👉 State designated stroke centers
- 👉 Application process for stroke center designation
- 👉 Stroke patients triaged by EMS to stroke center; EMS stroke recognition protocol
- 👉 Patients taken to stroke center if pre-hospital time <2hrs, patient has an airway and is not arresting

STROKE: What's being done around the country?

☞ Massachusetts

☞ Primary Stroke Service licensure program

- ☞ State application process
- ☞ Standards established for stroke center designation
- ☞ Designation by the Department of Public Health
- ☞ Internal center review process
- ☞ Center-driven quality improvement plan

STROKE: What's being done around the country?

👉 New Jersey

👉 Stroke Center Act

- 👉 Department of Health and Senior Services designates Primary or Comprehensive Stroke Centers
- 👉 Application/Grant process
- 👉 Minimal criteria set for patient care and support services

STROKE: What's being done around the country?

👉 Illinois

👉 Primary Stroke Center Designation Act

- 👉 Application process for stroke center designation
- 👉 Requirements set forth for stroke center designation
- 👉 Grant process available

STROKE: What's being done around the country?

👉 Florida

👉 Florida Stroke Act

- 👉 Statewide criteria for primary or comprehensive stroke center designation
- 👉 Hospitals must meet those criteria or submit affidavit of certification by the Joint Commission as a primary or comprehensive stroke center
- 👉 EMS providers to develop and implement stroke transport protocols

STROKE: What's being done around the country?

☞ Alabama

- ☞ Regional Stroke System
- ☞ Oversight body
- ☞ Protocol directed Stroke Center destination
- ☞ Components:
 - ☞ Pre-hospital
 - ☞ Hospital
 - ☞ Communications Center
 - ☞ Regional QI Committee
- ☞ Process:
 - ☞ Application
 - ☞ On-site visit

STROKE: What's being done around the country?

👉 Texas

👉 Stroke Center Designation

👉 Level 1: Comprehensive Stroke Centers

👉 Level 2: Primary Stroke Centers

👉 Level 3: Support Stroke Facilities

👉 Region-specific stroke transport plan for EMS

👉 EMS Training

STROKE: What's being done around the country?

👉 Tele-stroke

👉 Nevada

👉 Georgia REACH system

👉 New York State

👉 Also data from Bavaria

The background of the slide is a dark blue, almost black, field with a large, intricate, swirling pattern in a lighter blue hue. The pattern resembles a vortex or a series of concentric, wavy rings that spiral inward toward a central point, creating a sense of depth and motion. The text is centered over this pattern.

PART II: STEMI

STEMI

- ☞ Heart Disease, leading cause of death nationally and in Missouri
- ☞ In Missouri, 28.7% of deaths in 2004 were due to heart disease (CDC 2004 WISQARS)
- ☞ Rural populations, as with stroke, also face challenges in access to timely care

STEMI

- ☞ Why “Time Critical”?
- ☞ Time from symptom onset to treatment affects outcomes at 1-year:
 - ☞ Each 30 minute delay has been found to be associated with
 - ☞ Increased odds of EF <30% at discharge
 - ☞ Increased relative risk for mortality at 1 year
 - ☞ Overall increase in 1-year mortality of 7.5%
- ☞ Symptom onset to treatment time >4 hrs independent predictor of one-year mortality

☞ De Luca, et al., 2004.

☞ De Luca et al, 2003

STEMI

👉 Guidelines:

👉 Per the American College of Cardiology
and the American Heart Association

👉 TIMELY Percutaneous Coronary Intervention
(PCI)

👉 Mission Lifeline

STEMI

- 👉 Combined data from DANAMI-2 and PRAGUE-2 trials in Europe show
 - 👉 Transfer to primary PCI associated with significant decrease in non-fatal MI, stroke, or death compared to fibrinolysis

STEMI

👉 National Registry of Myocardial Infarction-2 study

👉 Direct relation between shorter door-to-balloon-times and lower adjusted risks of mortality

👉 Waters, R. et al 2004

STEMI

- 👉 Faster treatment and lower in-hospital mortality associated with
 - 👉 Hospital “specialization”
 - 👉 Emphasis on PCI as principal mode of reperfusion

👉 Rokos, I. et al, 2006.

STEMI

☞ PCI...

- ☞ Only high volume PCI hospitals have demonstrated ability to improve mean door-to-balloon times consistently
- ☞ PCI only available in <25% US hospitals
- ☞ 80% of Americans live within 1 hour's drive to PCI facility

STEMI

☞ Currently

- ☞ Fewer than 50% of patients have door-to-needle time within 30 minutes
- ☞ Fewer than 40% of patients with door-to-balloon time within the recommended 90 minutes

☞ Rokos, I. et al, 2006.

☞ Jaconbs, A. et al, 2007.

STEMI

☞ Currently

- ☞ Ambulances triage to the closest hospital rather than the PCI-capable hospital in regions without system of care
- ☞ Patient's who self-transport may lack the knowledge of which hospitals are PCI-capable

STEMI

- ✎ From Senators Specter, DeWine, McCain, Landrieu, Brownback, Hatch, and Kohl, May 2005 to the AHA and ACC
 - ✎ Concern that the medical profession has not adopted the ACC/AHA Guidelines for STEMI
 - ✎ Concern over inappropriate delay in transfer or refusal to transfer to definitive care (PCI)

STEMI

👉 Senator Recommendations

- 👉 EMS should attempt to transfer/direct possible MI patients to PCI-capable facilities
- 👉 Accreditation of Chest Pain Centers

STEMI

- ☞ The solution: a system to ensure that patients reach
 - ☞ The appropriate facility
 - ☞ Within the appropriate time
 - ☞ For appropriate care

STEMI

👉 Two Tier Approach

👉 National Registry of Myocardial Infarction data show

👉 50% of patients transported by EMS

👉 50% self-transport

👉 To catch both groups

👉 Pre-hospital Cardiac Triage

👉 Inter-hospital triage

STEMI

👉 Two Tier Approach

👉 Pre-hospital Cardiac Triage

- 👉 Based on trauma system concept
- 👉 High risk patients identified in the field
- 👉 Transport to designated hospital best equipped and staffed for appropriate level of care

👉 Rokos, I., et al 2006

STEMI

👉 Two Tier Approach

👉 Pre-hospital Cardiac Triage

👉 Boston Model

- 👉 Pre-hospital EKG
- 👉 Allows EMS to bypass non-PCI capable hospitals and take STEMI patients to PCI Center
- 👉 Oversight committee of participating hospitals
- 👉 Data safety and monitoring board

👉 Rokos, I., et al 2006

👉 Moyer, P. et al, 2004

STEMI

👉 Two Tier Approach

👉 Inter-hospital Triage

- 👉 Abbott Northwestern Hospital, MN, designated STEMI-receiving Center, “Level 1 Heart Attack Program”
 - 👉 Regional network “Hub and Spoke” model
 - 👉 28 Hospitals in 200 mile radius of PCI Center
 - 👉 Designate PCI Center and Zone 1 (<60 miles) and 2 (60-210 miles) Hospitals
 - 👉 Each hospital has level 1 MI toolkit (protocol checklist, transfer forms, clinical data forms, standing orders, adjunctive medications, laboratory supplies)

STEMI

👉 The Abbott Experience

👉 Standardized Protocols specify

- 👉 pre-transfer reperfusion options
- 👉 Allows transfer of STEMI patients with advanced age, recent cardiac arrest, or cardiogenic shock
- 👉 ED physician activates protocol with 1 call
- 👉 Clinical data faxed directly to PCI center cath lab
- 👉 Coordinated transfer plan, patients transferred directly to cath lab

👉 Henry, T. et al, 2007

STEMI

☞ The Abott Experience

- ☞ Outcomes: patients transferred from community centers to regional PCI center had outcomes similar to those taken directly to PCI center

☞ Henry, T. et al, 2007

STEMI

👉 Regional systems in place in areas of

👉 Maryland

👉 Massachusetts

👉 North Carolina

👉 Pennsylvania

👉 Georgia (Atlanta)

👉 Oregon (Portland)

👉 Minnesota

👉 California

👉 Florida

👉 Texas

👉 Michigan

STEMI

👉 Like stroke, these systems have been modeled on the trauma system concept

STEMI

- ☞ Strategies with strongest evidence for shorter door-to-balloon time
 - ☞ Effective use of pre-hospital EKG
 - ☞ Single call system
 - ☞ Activation of catheterization laboratory by emergency medicine physicians
 - ☞ Policies for catheterization team arrival
 - ☞ Clinical pathway implementation
 - ☞ Performance data monitoring/feedback

STEMI

- 👉 The Reperfusion of Acute Myocardial Infarction in North Carolina Emergency Departments (RACE) Study
- 👉 Quality Improvement study after system implementation in 5 regions in North Carolina
- 👉 Results:
 - 👉 Proportion of patients not receiving reperfusion decreased
 - 👉 Proportion of patients receiving primary PCI increased
 - 👉 Improved reperfusion times
 - 👉 Study not designed to examine mortality or test treatments
 - 👉 Jollis, et al 2007

STEMI

👉 The Mayo Clinic Regional STEMI System Protocol

- 👉 Standard order sets
- 👉 Prompt EKG
- 👉 ED activation of cath lab
- 👉 Cath lab readiness
- 👉 Central Communication Center
- 👉 Helicopter protocol
- 👉 Bypass of PCI center ED evaluation
- 👉 Prospective data collection

STEMI

👉 Mayo Clinic findings

- 👉 Establishment of a system is feasible
- 👉 Transport of STEMI patients in acute phase found to be safe
- 👉 Standardized protocols important
- 👉 Need coordinated transport plans
- 👉 Need for public education of importance of early access into system

STEMI

- 👉 Other initiatives: Paramedic training
 - 👉 Pre-hospital EKG
 - 👉 Plus, activation of cath lab
 - 👉 Specific training
 - 👉 Cypress Creek, Houston, TX
 - 👉 Northridge Hospital Medical Center, LA., CA

STEMI

👉 EMS-To-Balloon Time

- 👉 The growing standard...
- 👉 Symptom onset or EMS contact to treatment
- 👉 “The Golden Hour” Trauma concept
- 👉 <90 minutes goal
- 👉 30-30-30 Rule
 - 👉 30 minutes for EMS, the ED, and cath lab team preparation

Part III: Trauma as a Model

A large, abstract, blue-toned image serves as the background. It features a central, bright blue circular core from which several concentric, swirling bands of varying shades of blue radiate outwards. The overall effect is reminiscent of a vortex, a cyclone, or perhaps a stylized representation of an eye. The colors transition from a deep, dark blue at the edges to a lighter, more vibrant blue towards the center.

The Trauma System Concept

👉 The Benefit:

- 👉 50% reduction in preventable death rate after implementation
- 👉 Decrease in delays to disposition from 54% to 7%
- 👉 Decrease in cases of sub-optimal care from 32 to 3%

👉 MacKenzi, E. 1999
👉 Clay, M., et al 1999

The Trauma System Model

- ☞ Attaining formal trauma system designation and accreditation (ie meeting criteria for designated level)
 - ☞ Improves patient and hospital outcomes
 - ☞ Better outcomes compared to voluntary system
- ☞ Development of a formal regional system improves regional outcomes

☞ Barringer, M. et al 2005
☞ DiRusso, S. et al, 2001
☞ DeBritz, J and Pollack, A. 2006

The Trauma System Model

- ☞ Regional trauma systems with designated centers use resources more efficiently
- ☞ Cost Savings realized (decreased LOS, ICU LOS, overall decrease in hospital costs)

- ☞ Barringer, M. et al 2005
- ☞ DiRusso, S. et al, 2001
- ☞ DeBritz, J and Pollack, A. 2006

The Trauma System Model

☞ WHO Guidelines for Essential Trauma Care

☞ Stress the benefit of

- ☞ Verification of patient care capabilities
- ☞ Designation of level of care with expected minimum standards for that designation
- ☞ Accreditation

The Trauma System Model

- ☞ The Institute of Medicine Recommends
 - ☞ Development of geographically organized interconnected systems of care

☞ Roberts, A., 2007

The Trauma System Model

👉 Development Process

👉 Acceptance over time

👉 As benefits seen

👉 That hospitals with extensive experience with injured patients can offer more appropriate care than those receiving occasional trauma patients

- 👉 Shahid, S. et al., 2006
- 👉 Nathens, A. et al, 2000
- 👉 Boyd, D. and Cowley, R. A. 2005

The Trauma System Model

- ➡ Relationship between trauma system implementation and reduced mortality
- ➡ Latent period before reduction seen
- ➡ Suggests need for maturation period
 - ➡ to optimize protocols, inter-hospital transfer agreements, quality improvement processes, and other components

➡ Shahid, S. et al., 2006
➡ Nathens, A. et al, 2000
➡ Boyd, D. and Cowley, R. A. 2005

The Trauma System Model

- ✎ Trauma Community Consensus around
 - ✎ Development under legislative mandate
 - ✎ Lead agency responsible for designation and oversight
 - ✎ Triage criteria
 - ✎ Out-of-area survey teams
 - ✎ Ongoing system-wide evaluation by a trauma advisory board

Next Steps

- 👉 Information Synthesis
- 👉 What will work for Missouri